

# **Spatial Temperature Variations in the Lagoon Nebula (M8)**

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## **1. Abstract**

MU-SPIN NRTS South Carolina State University (SCSU) and City College of New York (CCNY) have collaborated to fund student astrophysical research during the summer of 1998. The results of one such student are presented.

The emission nebula M8 has been examined using ground based CCD imagery taken through narrowband interference filters at select wavelengths of diagnostic importance (e.g., temperature). The IRAF software package was used in the standard manner to calibrate the raw images. Further details of the data reduction can be found elsewhere in this conference (see Taran Tulsee's poster). The ultimate goal of this project is to produce a temperature map of the nebula using the doubly ionized oxygen atom, which emits at a wavelength of 4363 and 5007 angstroms. The ratio of images obtained at these two wavelengths will lead to the most detailed spatial temperature map of M8 to date. This map will be of importance to future researchers in determining chemical abundance variations among M8 and other galactic emission nebulae.

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## **2. Summary**

### **NRTS Summer Collaboration**

In a collaborative effort to motivate undergraduate students to develop an interest in Astronomy and Space Science, the MU-SPIN NRTS sites at SCSU and CCNY have participated in a research exchange program that involved students from each NRTS.

The presenter of this poster had the opportunity, for the first time, to have hands-on use of an 8" telescope during astronomical observing nights set up by the observing team. The observing team was composed by Taran Tulsee (Queensborough Community College—see his poster display), Anthony Williams (SCSU), Ely Duenas (Hunter College of CUNY), and was guided by Dr. Donald Walter (SCSU). Such observing experience was very rewarding for students who are considering a career in the Space Sciences. Additionally, the students gained computing/technical skills including web publishing, digital image processing, working in the UNIX environment, and the use of SUN workstations.

### **About the Lagoon Nebula, M8**

Also called NGC 6523, the Lagoon Nebula is about 5200 light-years from the Sun and in the direction of the center of the galaxy, and it can be seen by the naked eye as a comet-like glow in the Sagittarius constellation. M8 contains dust and gas clouds where new stars form; it gets its energy from ultraviolet (UV) radiation that results from interacting with young hot stars in its midst, and it is seen as a glowing region of hydrogen gas called an "HII" region. In the nucleus of the nebula, a dumbbell-shaped feature—the Hourglass—is observed, which has a high surface brightness. Another interesting feature of the Lagoon nebula are the Bok globules, which are tiny, circular dark nebula against the

brilliant nebular background, with diameters of 7,000 to 10,000 AU, produced by relatively dense clouds of dust. Globules are thought to be protostars or new stars in their earliest stages of formation.

### Results from this Study

This poster will summarize the results of the data reduction and image processing performed on a set of ground-based images taken of the nebula through narrow-band interference filters. These images were examined using the IRAF software package to remove sources of noise and produce data which is scientifically useful. An example of this will be presented in the form of a temperature map of the nebula using the ratio of two images taken at different wavelengths of doubly ionized oxygen. After additional analysis, the results of this study will be published and made available for others interested in determining chemical abundances and modeling HII regions.